mal bony architecture at the articular surfaces of both the tibial plateau and femoral condyles in the aging rhesus macaques. These images also confirmed marked extraarticular ossification and osteophytosis.
The corresponding micro-MRI images confirmed the association of cartilage loss in the weight bearing regions of the joint and defined areas of soft tissue alteration and degeneration in and around the joint space. These images were most valuable in the quantitation of cartilage loss as it relates to the bone remodeling process in progressive OA.
Conclusions: These results indicate that 4.7T micro-MRI and micro-CT can be used in the early detection of microscopic changes in the bone and cartilage in early degenerative disease of cartilage and bone respectively, in rhesus macaques. These methods are also valuable in the long-term studies of OA disease progression.

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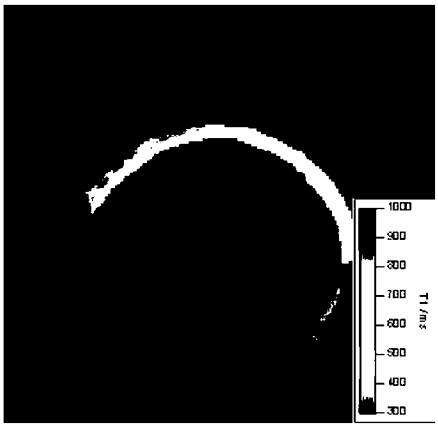
ASSESSING CARTILAGE HEALTH WITH 3-D DGEMRIC IN PATIENTS WITH FEMOROACETABULAR IMPINGEMENT

DC Wilson[1], B Maedler[2], CP Duncan[1], DS Garbuz[1], DR Wilson[1]
[1]Orthopaedics, UBC, Vancouver, BC, Canada; [2]Philips Medical Systems, Canada

Introduction: Femoroacetabular impingement (FAI), in which femoral deformities lead to damage of the labrum and/or cartilage, has been proposed as a mechanism explaining idiopathic osteoarthritis in non-dysplastic hips. This hypothesis is supported by histological analysis showing that femoral head cartilage from young patients with impingement exhibits degenerative changes similar to OA. Further tests of this hypothesis will rely on identifying a noninvasive method for assessing cartilage degeneration at the hip. Our objective was to assess the feasibility of using dGEMRIC (delayed gadolinium-enhanced magnetic resonance imaging of cartilage) to assess glycosaminoglycan (GAG) distribution in articular cartilage of patients with hip impingement.
Methods: Three-dimensional dGEMRIC was performed on four patients diagnosed with femoroacetabular impingement syndrome (hip pain, positive impingement test) and four controls matched for age and body mass index. All subjects were intravenously injected with 0.2 mM/kg Magnevist and asked to perform hip rotations for 10 minutes followed by 20 minutes of walking to facilitate diffusion of the contrast agent into the cartilage. Imaging started 75 minutes after injection. We used a Philips Intera 3T scanner with a flexible surface coil around the hip. T1 maps for 20 slices were generated from true sagittal images using a 3D IR-TFE sequence with the following parameters: TR/TE = 4.7/1.6, TI = 1.6, 1.2, 0.8, 0.4, 0.2, 0.15, 0.1 s, FOV = 220 mm, Matrix: 256 × 256 (interpolated to 512 x 512), 3mm slice thickness. Scan time was approximately 35 minutes.
Results: In two of the four subjects, the symptomatic subjects had dGEMRIC indices that were more than 150 ms lower than the matched controls and fell in the range of values for subjects with osteoarthritis in a previous study (Table 1). In the other two subjects the differences in dGEMRIC index were small. In all but one of the eight subjects the dGEMRIC index was lower in the anterior region than in the posterior region.

Table 1. Average T1 over four slices for four patients and their matched controls. ROI's were divided into anterior and posterior

	Average T1 for Four Slices					
	Patient T1 (ms)			Control T1 (ms)		
No.	Sex/Age	Anterior	Posterior	Sex/Age	Anterior	Posterior
1	F-19	630	569	F-24	779	792
2	M-36	453	577	M-34	726	793
3	M-40	624	636	M-35	614	725
4	M-36	692	711	M-34	691	751



Discussion: Our experience with the protocol and these results suggest that dGEMRIC can be used to assess cartilage changes in studies of femoroacetabular impingement. These results suggest that there are detectable changes in cartilage in some patients with femoroacetabular impingement, but no detectable changes in others. They also suggest that cartilage degeneration may be localized in FAI, which supports dividing the hip into regions of interest for analysis.

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VALIDATION OF A MAGNETIC RESONANCE IMAGING PROTOCOL TO ESTIMATE ARTICULAR CARTILAGE VOLUME IN THE ELBOWS OF MEDIUM-SIZED DOGS

AS Maclaughlan[1], R Savage[2], P Clegg[1], U Hetzel[1], D Hughes[3], JF Innes[1]
[1]Veterinary Clinical Science, University of Liverpool, Liverpool, United Kingdom; [2]Human Anatomy & Cell Biology, University of Liverpool, Liverpool, United Kingdom; [3]Burgess Diagnostics Ltd., Pickering, United Kingdom

Introduction: Canine elbow osteoarthritis (eOA) is a common, naturally-occurring, rapidly progressing disease. Non-invasive anatomical outcome measures in the live dog are currently non-existent. The aim of this study was to validate a magnetic resonance imaging (MRI) protocol for the assessment of articular cartilage volume (ACV), with a view to using this information to determine rate of disease progression in cases of eOA. This naturally-occurring model potentially provides a means to evaluate candidate structure-modifying agents.
Materials & Methods: Six radiographically normal elbows from three medium-sized, mixed-breed canine cadavers (two male & one female, age 1-2 years) were selected from dogs euthansed for reasons other than orthopaedic disease. All six limbs were scanned in a 1.0T MR scanner (Gyroscan, Philips) using the 3D-FFE-FS sequence - a 3D, fat-suppressed, gradient echo sequence as has been validated previously for ACV measurements in the human knee. Following scanning the joints were assigned randomly to have either cartilage dissection (group 1) or sagittal sectioning (group 2).
Group 1 elbows had their bony components (humerus, radius & ulna) dissected free from associated soft-tissues. The relevant bone ends (capitulum, radial head & ulnar notch/coronoid processes) were then laser-scanned using a high resolution laser scanner (DT1200, Laser Design Inc. MN). The cartilage was then removed from the bone ends, and the scanning process repeated. Using proprietary software a differential volume figure was calculated.
Group 2 elbows were frozen and sectioned longitudinally into